FINAL REPORT
BOTANICAL SURVEY OF THE MONUMENT CANYON RESEARCH NATURAL AREA

Submitted to
Rocky Mountain Forest and Range Experiment Station
By
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BOTANICAL SURVEY OF THE MONUMENT CANYON RESEARCH NATURAL AREA

INTRODUCTION

The Monument Canyon Research Natural Area (RNA) is located in the Jemez Ranger District of the Santa Fe National Forest, New Mexico; Section 9, Township 18 North, Range 3 East.

A preliminary reconnaissance of the RNA was performed in September, 1978 to help in preparing a study plan and to determine the number of vegetation types represented in the area.

The typing of the five communities found in the RNA followed Brown and Lowe (1974). The types are:

I. Pinus ponderosa Associations - dense dog-hair stands
II. P. ponderosa Associations - open mature stands
III. P. ponderosa Mixed Conifer Associations
IV. Quercus Associations
V. Cercocarpus Associations

Subsequent field work and aerial photo interpretation supported these initial classifications.

METHODS

Within each vegetation type, one or more permanent transects were established. Initially, a minimum of three transects per type were planned, with the exception of the essentially monospecific dog-hair ponderosa pine stands. However, it became apparent once the field work was begun that in two cases, the Quercus and Cercocarpus Associations, the linear nature and relatively limited extent of the two types would not accomodate three transects each. As a result, only two and one transects, respectively, were established.

Each transect was marked with a 3/8 in diameter X 2 1/2 ft long rebar, painted on the top with orange fluorescent paint. Each was also located on an aerial photo of the RNA.

Transects were run on compass headings, beginning at the rebar marker. The choices of compass bearings were made at random, a priori. However, adjustments had to be made once in the field to prevent the crossing of vegetation type boundaries. In addition, the transects in the linear shaped Quercus and Cercocarpus Associations were, of necessity, oriented in the same direction as the stands themselves.

From each transect headstake, a pace transect was run on the selected compass bearing. At each second step (approximately 1.7 m or 5.5 ft), a 5X10 cm microplot was read (Morris 1973). At each microplot, living plant cover was recorded by species, by the following scale: $t<5\%$, $1 = 6\text{-}15\%$, $2 = 16\text{-}25\%$, $3 = 26\text{-}35\%$, $4 = 36\text{-}45\%$, $5 = 46\text{-}55\%$, $6 = 56\text{-}65\%$, $7 = 66\text{-}75\%$, $8 = 76\text{-}85\%$, $9 = 86\text{-}95\%$, $10 = 96\text{-}100\%$. Shrubs and half-shrubs were included, but tree species were not. Synusae

were evaluated separately, hence, individual microplots occasionally exceeded 100% cover.

At each 20th step, a 1X1 m count-list quadrat (Brown 1954; Phillips 1959) was located and read. All herbaceous perennials and shrubs rooted within the plot were tallied, as well as tree seedlings and sprouts less than 2m tall. At the headstake, 5th and 10th count-list quadrat, basal area of stems over 5 in dbh were tallied using a prism with a basal area factor of 5 (metric).

One black and white photo was taken from the head of each transect.

Two specimens of each plant species, other than common ones, were collected for identification and storage for the purpose of initiating a reference collection and a permanent record of species from the Monument Canyon RNA. Additionally, a list was compiled of species observed though not sampled along the transects. These species are included in the list presented in this report. Nomenclature follows Harrington (1964) and Kearney and Peebles (1960).

Interpretation of aerial photos supplied by the U. S. Forest Service was used in conjunction with the data collected in this study to produce a final vegetation map of the RNA. Scale of the final map is 8 in per mile.

RESULTS

Five distinct community types were confirmed in the Research Natural Area. They are:

I. Pinus ponderosa - dense dog-hair
II. P. ponderosa - open mature
III. P. ponderosa - Mixed Conifer
IV. Quercus
V. Cercocarpus.

Type I.

The dense dog-hair ponderosa stands are, with the exception of a few other sparsely scattered species, monospecific. The ponderosas are generally either of a uniformly stunted form typical of high density reproduction, or over-mature individuals. Interspersed within these are a large number of dead trees in various stages of decomposition. There is no understory to speak of. Only an occasional herb has managed an existence below the dense overstory of pine and within the thick layer of litter made up almost exclusively of pine needles and rotting pine branches and stems. The more conspicuous of the understory plants is the saprophyte Indian pipestem (Pterospora andromeda). The only other two species encountered were Muhlenbergia montana and Harbouria trachypleura.

Due to its apparently even age, the dog-hair stand appears to be the result of a fire in the area. Results of research into the fire ecology of the Jemez Mts. (Foxx and Potter 1978) would suggest that a fire probably devastated the area after years of fire suppression management. The intensity of the fire would have been enhanced by the buildup of fuel over the years of management. The near removal of all trees in the burn would subsequently result in an even-aged stand of reproduction. This dense stand with its high fuel load plus the complement of over-mature and large dead trees has the potential for another hot, killing fire; after which the cycle would start again.

The need for some form of management in Type I is obvious. Some manual

thinning of the type has been conducted for some years in adjacent areas. The RNA has, however, been left alone. The alternative to this approach would be controlled burning; admittedly a difficult tool to manage. The fact that the RNA was more than likely affected by fire suppression management qualifies its status as a truly natural system and as such leads to the conclusion that some form of manipulation may be justified in the future.

Type II.

The open-mature stands of ponderosa pine are an important element of the RNA. They exist as extensive units as well as more local entities existing as ecotones between the P. ponderosa - Mixed Conifer (III) and the Quercus (IV) or Cercocarpus (V) communities.

As the type name implies, these stands have an open nature not unlike what is often described as "park-like", except for the more angular terrain which exists here. With an overstory considerably more sparse than in Type I comes an understory much more varied and abundant, as can be seen in the data summary. This type has the highest potential for forage production and in fact is apparently being managed for cattle grazing. There appears to be adequate ponderosa reproduction but is in no way excessive. At the same time, the mature trees appear to be healthy and little evidence of decadence exists.

The potential for fire in the extensive areas covered by Type II appears low. Evidence of past massive destruction by fire is not apparent either by obvious fire damage or by species composition. The large amount of ground covered by rock or mineral soil and the lack of thick accumulations of conifer litter would tend to preclude the possibility of a fire becoming more than a relatively local occurance. On the other hand, the Type II areas which grade into Type III are generally of a closer nature with a correspondingly higher fuel load and consequent higher fire potential.

Type III.

The ponderosa - mixed conifer communities are found, as would be expected, on the cooler, more northernly exposures of the RNA. Limber pine (Pinus flexilus) mixes with the ponderosa on the edges of the type while Douglas-fir (Pseudotsuga taxifolia) and white fir (Abies concolor) become more important as one goes further into the zone and into the more mesic canyons.

While the total production of timber is no doubt greater than in Type II, the understory forbs, shrubs, and grasses decline in production as a result of the denser overstory, deeper and more resinous litter, and cooler climate. Arctostaphylos uva-ursi is an important ground cover in this type.

Not suprisingly, an important part of the RNA's watershed is in this community. Much of the summer rainfall appears to run off of these areas and it would seem likely that this zone would contain the majority of the winter snowpack.

Although the Type III areas are on the average more mesic than Type II, the resultant increased vegetative growth may tend to offset this advantage in terms of susceptability to fire. A number of times during the summer of 1979 lightning storms occurred over these areas and the possibility of a lightning-caused fire seemed very distinct. Occasional "catfaces" confirm the possibility.

Type IV.

The gambel oak (Quercus gambellii) type is restricted to the dry, southern exposures along the cliff faces. There is only one long continuous stand, about 2500 ft long. The prevalent shrub found along with oak in this narrow band of vegetation is rubber rabbitbrush (Chrysothamnus nauseosus), which is to be expected in the more xeric conditions extant in this habitat. The other species which is important in Type IV, mountain muhly, is a common species in all but one of the vegetation types of the RNA; the exception being Type I. Sheep fescue (Festuca ovina), though not as important as mountain muhly in the oak type, is common to all the communities of the RNA.

Type V.

The only area in the RNA where mountain mahogony (Cercocarpus montanus) was observed in a well-defined stand was along an east-west oriented ridge at the north end of section 9. Mountain muhly is the most important species in Type V in terms of density and frequency. A number of other species which were not found in the other types are relatively abundant here. These include: Bouteloua gracilis, Artemisia frigida, and Gutierrezia sarothrae.

It appears that Types IV and V fill the niches provided by the various ridges found within the RNA; Type IV on the more xeric ridges of southern exposure and Type V on the relatively more mesic ridges with a northern exposure.

STEMS GREATER THAN FIVE INCHES DBH

	TALLY BY SPECIES				BASAL AREA/SP.				TOTAL
	SPECIES				(M^2/HA)				(M^2/HA)
Tr.#	Pipo	Pifl	Abco	Psta	Pipo	Pifl	Abco	Psta	
1	30				150				150
2	24				120				120
3	16				80				80
4	4	1			20	5			25
5	11				55				55
6	9	6	3	6	45	30	15	30	120
7	5				25				25
8	11	3	3	5	55	15	15	25	110
9									0
10	13	2		3	65	10		15	90

AVERAGE BASAL AREA (M^2/HA) OF STEMS GREATER THAN FIVE INCHES PER VEGETATION TYPE

TYPE	SPECIES				TOTAL
(& Tr.#)	Pipo	Pifl	Abco	Psta	
I (1)	150				150
II (2, 3, 5)	85				85
III (6, 8, 10)	55	18.3	10	23.3	106.6
IV (4, 7)	22.5	2.5			25
V (9)					0

MONUMENT CANYON RESEARCH NATURAL AREA

SPECIES LIST

TREES:
Abies concolor
Juniperus scopulorum
Pinus flexilus
Pinus ponderosa
Pseudotsuga taxifolia
Robinia neomexicana

SHRUBS:
Arctostaphylos uva-ursi
Artemisia frigida
Cercocarpus montanus
Chrysothamnus nauseosus
Clematis ligusticifolia
Gutierrezia sarothrae
Jamesia americana
Juniperus communis
Philadelphus sp.
Quercus gambellii
Ribes sp.
Senecio sp.
Symphoricarpus alba

FORBS:
Antennaria marginata
Erigeron sp.
Eriogonum sp.
Fragaria sp.
Geranium sp.
Harbouria trachypleura
Hymenoxys sp.
Lepidium sp.
Lithospermum sp.
Lotus wrightii
Penstemon eatoni
Penstemon strictus
Potentilla pulcherrima
Psilostrophe tagetina
Pterospora andromeda

RNA SPECIES LIST (CON'T)

GRASSES:
Avena sativa
Bouteloua gracilis
Festuca arizonica
Festuca ovina
Hilaria jamesii
Hordeum jubatum
Muhlenbergia montana
Setaria sp.
Sitanion hystrix

DATA SUMMARY

TYPE I

Species	Cover (%)	Density (no./m^2)	Freq.	I. V.*
Pterospora andromeda	0	0.800	0.100	1.300
Festuca ovina	0.025	0.200	0.100	1.200
Harbouria trachypleura	0.025	0	0	0.500
				3.000

TYPE II

Species	Cover (%)	Density (no. /m^2)	Freq.	I. V.
Festuca ovina	5.790	3.133	0.467	1.376
Muhlenbergia montana	0.450	3.733	0.400	0.772
Lotus wrightii	0.500	0.133	0.100	0.143
Penstemon eatoni	0.667	0.067	0.033	0.110
Robinia neomexicana	0.433	0.033	0.033	0.078
Setaria sp.	0	0.200	0.067	0.070
Fragaria sp.	0.108	0.267	0.033	0.068
Geranium sp.	0.033	0.067	0.067	0.058
Senecio sp.	0	0.100	0.067	0.058
Antennaria marginata	0.033	0.233	0.233	0.055
Festuca arizonica	0.033	0.100	0.033	0.039
Erigeron sp.	0	0.133	0.033	0.039
Potentilla pulcherrima	0	0.100	0.033	0.035
Hilaria jamesii	0	0.033	0.033	0.027
Lepidium sp.	0	0.033	0.033	0.027
Ribes sp.	0.200	0	0	0.024
Arar	0.167	0	0	0.020
Sitanion hystrix	0.042	0	0	0.005
Lithospermum sp.	0.033	0	0	0.004
				3.008

DATA SUMMARY (CON'T.)

TYPE III

Species	Cover (%)	Density (no. /m^2)	Freq.	I. V.
Festuca ovina	1.250	1.733	0.467	0.616
Antennaria marginata	0.133	4.467	0.233	0.481
Fragaria sp.	0.350	1.933	0.233	0.333
Muhlenbergia montana	0.133	1.400	0.267	0.267
Arctostaphylos uva-ursi	1.200	0.133	0.033	0.267
Forb 1	0.833	0.533	0.100	0.257
Eriogonum sp.	0.400	0.500	0.067	0.152
Forb 3	0.083	1.433	0.033	0.140
Erigeron sp.	0.067	0.533	0.167	0.097
Jamesia americana	0	0.133	0.067	0.082
Psilostrophe tagetina	0	0.133	0.133	0.077
Clematis ligusticifolia	0.167	0.033	0.033	0.052
Quercus gambellii	0.133	0.067	0.033	0.049
Umbel sp.	0.233	0	0	0.047
Potentilla sp.	0	0.133	0.033	0.027
Hymenoxys sp.	0	0.067	0.033	0.022
Geranium sp.	0.008	0.033	0.033	0.021
Pterospora andromeda	0	0.033	0.033	0.019
				3.006

TYPE IV

Species	Cover (%)	Density (no. /m^2)	Freq.	I. V.
Quercus gambellii	14.050	2.400	0.500	1.262
Muhlenbergia montana	2.400	4.200	0.550	0.844
Festuca ovina	0.100	0.850	0.300	0.249
Forb 1	0.650	1.550	0.100	0.245
Chrysothamnus nauseosus	1.150	0.200	0.200	0.187
Robinia neomexicana	0	0.250	0.150	0.104
Philadelphus sp.	0.250	0.350	0.050	0.075
Penstemon strictus	0	0.050	0.050	0.031
				2.997

DATA SUMMARY (CON'T.)

TYPE V

Species	Cover (%)	Density (no. /m^2)	Freq.	I. V.
Muhlenbergia montana	10.800	7.100	0.800	1.296
Cercocarpus montanus	12.100	0.100	0.100	0.455
Bouteloua gracilis	1.900	2.000	0.300	0.358
Artemisia frigida	2.000	0.800	0.200	0.218
Gutierrezia sarothrae	0	0.600	0.300	0.176
Philadelphus sp.	2.000	0.300	0.100	0.134
Quercus gambellii	0	0.500	0.200	0.125
Ribes sp.	1.100	0.100	0.100	0.087
Chrysothamnus nauseosus	0	0.100	0.100	0.050
Festuca ovina	0	0.100	0.100	0.050
				2.999

* Importance Value

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Location_____ Date_____ F3

S____T____R____ Trans.Nos. 1

Study_____ Type I

Summary Sheet

species

Tr.	Hatr	Feov	Ptan
1		.200	0.800
2			
3			
4			
5			
Ave		0.200	0.800
RDen		20%	80%
1		1	1
2			
3			
4			
5			
Ave		0.100	0.100
RD		50%	50%
1	0.025	0.025	
2			
3			
4			
5			
Ave	0.025	.025	
RDen	50%	50%	
R.V.	0.500	1.200	1.300

Rel. Density = $\frac{\text{No. individuals of } i^{th}}{\text{No. individuals of all species}} \times 100 = \frac{Ni}{} \times 100$

Rel. Freq. = $\frac{\text{Freq. of } i^{th} \text{ species}}{\Sigma \text{ Freq. of all species}} \times 100 = \frac{Fi}{} \times 100$

Rel. Dom. = $\frac{\Sigma \text{ of cover of } i^{th} \text{ species}}{\Sigma \text{ of cover of all species}} \times 100 = \frac{Ci}{} \times 100$

Location _____ Date _____ F3

S ___ T ___ R ___ Trans.Nos. 2, 3, 5

Study _____ Type II

Summary Sheet

species

Tr.	Feov	GERA	Lotus	PENST	FRAG	Mumo	Fear	Rone
1	3.2		0.2	0.2	0.8	0.8		
2	6.2					4.5	0.3	
3		0.2	0.2			5.9		0.1
4								
5								
AD	3.133	0.067	0.133	0.067	0.267	3.733	0.100	0.033
RD	37.45	0.80	1.59	0.80	3.19	44.63	1.20	0.39
1	.7		0.2	0.1	0.1	0.2		
2	.7					0.4	0.1	
3		0.2	0.1			0.6		0.1
4								
5								
AD	0.467	0.067	0.100	0.033	0.033	0.400	0.033	0.033
RD	28.05	4.024	6.006	1.982	1.982	24.024	1.982	1.982
1								
2								
3								
4								
5								
AD	5.790	0.033	0.500	0.667	0.108	0.450	0.033	0.433
RD	68.21	0.39	5.89	7.86	1.27	5.300	0.39	5.10
I.V.	1.376	0.058	0.143	0.110	0.068	0.772	0.039	0.078

Rel. Density = $\frac{\text{No. individuals of } i^{th}}{\text{No. individuals of all species}} \times 100 = \frac{Ni}{} \times 100$

Rel. Freq. = $\frac{\text{Freq. of } i^{th} \text{ species}}{\Sigma \text{ Freq. of all species}} \times 100 = \frac{Fi}{} \times 100$

Rel. Dom. = $\frac{\Sigma \text{ of cover of } i^{th} \text{ species}}{\Sigma \text{ of cover of all species}} \times 100 = \frac{Ci}{} \times 100$

Location_____ Date_____ F3

S____T____R____ Trans.Nos. 2, 3, & 5 cont.

Study_____ Type II

Summary Sheet

species

Tr.	Anma	SENE	Popu	SETARIA	ERIG	Hija	LEPI	Ribes	Sihy	Arar	LITH		
1	0.7												
2		0.2	0.3	0.6	0.4								
3		0.1				0.1	0.1						
4													
5													
Di	0.233	0.100	0.100	0.200	0.133	0.033	0.033						Σ=8.365
RDen	2.79	1.20	1.20	2.39	1.60	0.39	0.39						
1	0.7												
2		0.1	0.1	0.2	0.1								
3		0.1				0.1	0.1						
4													
5													
Di	0.233	0.067	0.033	0.047	0.033	0.033	0.033						Σ=1.665
RF	13.994	4.024	1.982	4.024	1.982	1.982	1.982						
1													
2													
3													
4													
5													
Di	0.033							0.200	0.042	0.167	0.033		Σ=8.489
RDen	0.39							2.36	0.49	1.97	0.39		
Fi	0.055	0.058	0.035	0.070	0.039	0.027	0.027	0.024	0.005	0.020	0.004		

Rel. Density = $\frac{\text{No. individuals of } i^{th}}{\text{No. individuals of all species}} \times 100 = \frac{Ni}{} \times 100$

Rel. Freq. = $\frac{\text{Freq. of } i^{th} \text{ species}}{\Sigma \text{ Freq. of all species}} \times 100 = \frac{Fi}{} \times 100$

Rel. Dom. = $\frac{\Sigma \text{ of cover of } i^{th} \text{ species}}{\Sigma \text{ of cover of all species}} \times 100 = \frac{Ci}{} \times 100$

Location _____ Date _____ F3

S ____ T ____ R ____ Trans.Nos. 6, 8 & 10

Study _____ Type Pipo - Mixed III

Summary Sheet

species

Tr.	Feov	Mumo	FRAG	Anma	Quga	Clli	ForbI	Umbel	ERIG	Forb3	Aruv	GERA	Psta
1	2.3	1.9	2.6	12.8	0.2		0.5						0.2
2	1.2	2.3	1.7				1.1		1.6	4.3			0.1
3	1.7		1.5	0.6		0.1					0.4	0.1	0.1
4													
5													
AC	1.733	1.400	1.933	4.467	0.067	0.033	0.533		0.533	1.433	0.133	0.033	0.133
RD	12.62	10.20	14.08	32.53	0.49	0.24	3.88		3.88	10.44	0.97	0.24	0.97
1	0.3	0.4	0.4	0.5	0.1		0.1						0.2
2	0.5	0.4	0.2				0.2		0.5	0.1			0.1
3	0.6		0.1	0.2		0.1					0.1	0.1	0.1
4													
5													
AC	0.467	0.267	0.233	0.233	0.033	0.033	0.100		0.167	0.033	0.033	0.033	0.133
RD	20.92	11.96	10.44	10.44	1.48	1.48	4.48		7.48	1.48	1.48	1.48	5.96
1													
2													
3													
4													
5													
AC	1.250	0.133	0.350	0.133	0.133	0.167	0.833	0.233	0.067	0.083	1.200	0.008	
RD	25.05	2.67	7.01	2.67	2.67	3.35	16.69	4.67	1.34	1.66	24.05	0.16	
I.V.	0.616	0.267	.333	.481	.049	.052	.257	.047	.097	.140	.267	.021	.077

Rel. Density = $\frac{\text{No. individuals of } i^{th}}{\text{No. individuals of all species}} \times 100 = \frac{Ni}{\quad} \times 100$

Rel. Freq. = $\frac{\text{Freq. of } i^{th} \text{ species}}{\Sigma \text{ Freq. of all species}} \times 100 = \frac{Fi}{\quad} \times 100$

Rel. Dom. = $\frac{\Sigma \text{ of cover of } i^{th} \text{ species}}{\Sigma \text{ of cover of all species}} \times 100 = \frac{Ci}{\quad} \times 100$

Location _____ Date _____ F3

S ___ T ___ R ___ Trans.Nos. 6, 8, 10 Cont.

Study _____ Type III

Summary Sheet

species

Tr.	HYME	Jaam	POTE	Ptan	Abco	Pipo	Pifl	ERIO					
1	0.2	0.3			0.1	0.1							
2		0.1	0.4				0.1						
3				0.1	0.1	0.6		1.5					
4							0.3						
5													
D	0.067	0.133	0.133	0.033	0.067	0.233	0.133	0.500	Σ=	13.730			
RD	0.49	0.97	0.97	0.24	0.49	1.70	0.97	3.64					
1	0.1	0.1			0.1	0.1							
2		0.1	0.1				0.1						
3				0.1	0.1	0.2		0.2					
4							0.1						
5													
F	0.033	0.067	0.033	0.033	0.067	0.100	0.067	0.067	Σ=	2.232			
RF	1.48	3.00	1.48	1.48	3.00	4.48	3.00	3.00					
1													
2													
3													
4													
5													
C								0.400	Σ=	4.990			
RC								8.02					
I.V.	.022	.082	.027	.019				.152					

Rel. Density = $\frac{\text{No. individuals of } i^{th}}{\text{No. individuals of all species}} \times 100 = \frac{Ni}{} \times 100$

Rel. Freq. = $\frac{\text{Freq. of } i^{th} \text{ species}}{\Sigma \text{ Freq. of all species}} \times 100 = \frac{Fi}{} \times 100$

Rel. Dom. = $\frac{\Sigma \text{ of cover of } i^{th} \text{ species}}{\Sigma \text{ of cover of all species}} \times 100 = \frac{Ci}{} \times 100$

Location _____ Date _____ F3

S ____ T ____ R ____ Trans.Nos. 4 & 7

Study _____ Type Quercus IV

Summary Sheet

species

Tr.	Quga	Feov	Mumo	PHIL	Forbl	Chna	Pest	Rone	Pifl				
1	2.7	1.6	5.5	0.7	3.1	0.1	0.1		0.1				
2	2.1	0.1	2.9			0.3		0.5					
3													
4													
5													
Σ	2.40	0.85	4.20	0.35	1.55	0.20	0.05	0.25	0.05				Σ=9.90
RD	24.24	8.59	42.42	3.54	15.66	2.02	0.51	2.53	0.51				
1	0.5	0.5	0.6	0.1	0.2	0.1	0.1		0.1				
2	0.5	0.1	0.5			0.3		0.3					
3													
4													
5													
Σ	0.5	0.3	0.55	0.05	0.1	0.2	0.05	0.15	0.05				Σ=1.95
RF	25.64	15.38	28.21	2.56	5.13	10.26	2.56	7.69	2.56				
1													
2													
3													
4													
5													
Σ	14.050	0.100	2.400	0.250	0.650	1.150							Σ=18.600
RDom	75.54	0.54	12.90	1.34	3.49	6.18							
I.V.	1.262	.249	.844	.075	.245	.187	.031	.104					

Rel. Density = $\frac{\text{No. individuals of } i^{th}}{\text{No. individuals of all species}} \times 100 = \frac{Ni}{} \times 100$

Rel. Freq. = $\frac{\text{Freq. of } i^{th} \text{ species}}{\Sigma \text{ Freq. of all species}} \times 100 = \frac{Fi}{} \times 100$

Rel. Dom. = $\frac{\Sigma \text{ of cover of } i^{th} \text{ species}}{\Sigma \text{ of cover of all species}} \times 100 = \frac{Ci}{} \times 100$

Location _____ Date _____ F3

S ___ T ___ R ___ Trans.Nos. 9

Study _____ Type Cemo V

Summary Sheet

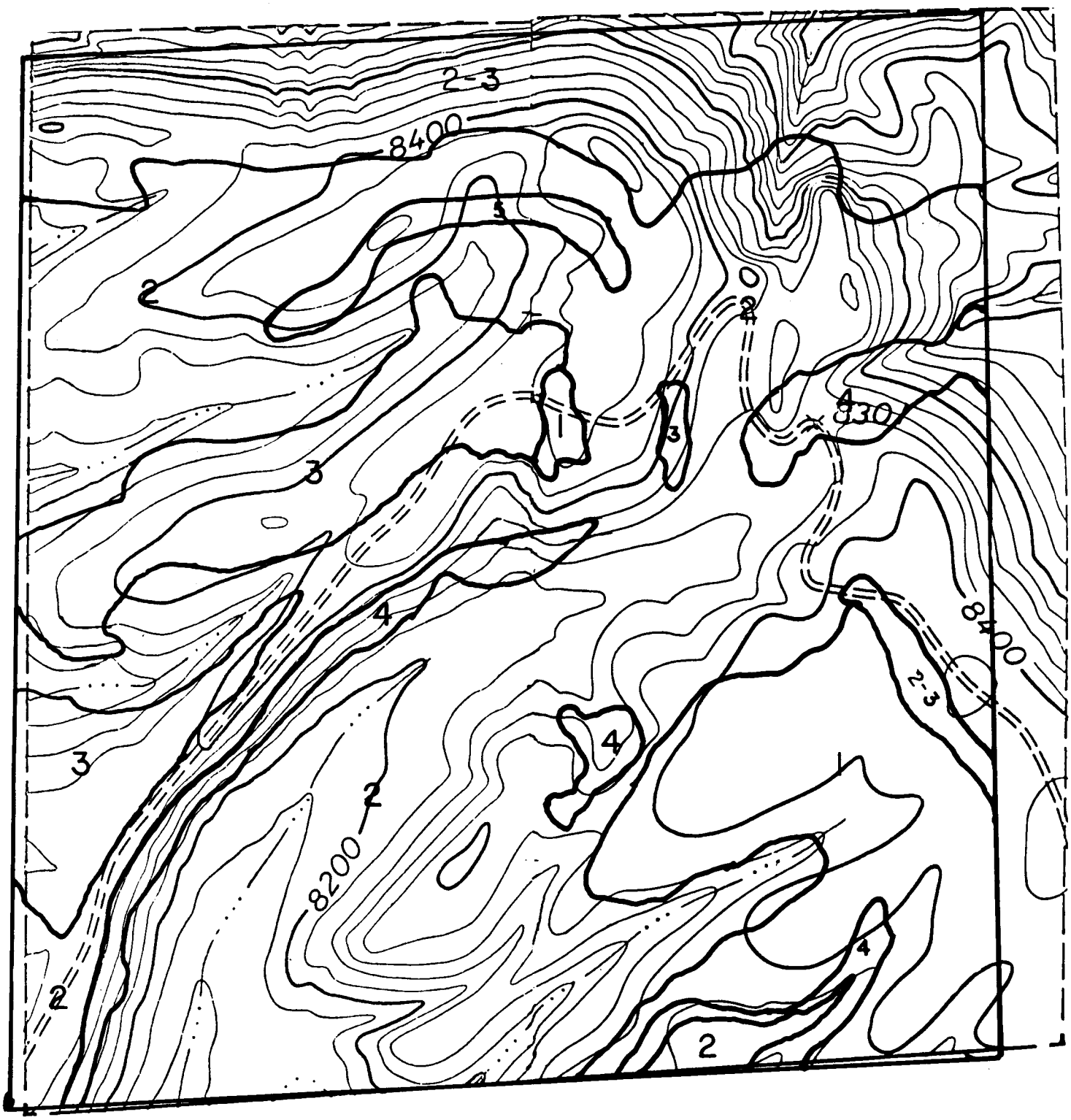
species

Tr.	Cemo	Bogr	Arfr	PHIL	RIBES	Mumo	Chna	Quga	Feor	Gusa	Erja		
Density 1	0.1	2.0	0.8	0.3	0.1	7.1	0.1	0.5	0.1	0.6	0.1		
2													
3													
4													
5													
Σ	0.1	2.0	0.8	0.3	0.1	7.1	0.1	0.5	0.1	0.6	0.1		Σ = 11.8
RDen	0.85	16.95	6.78	2.54	0.85	60.17	0.85	4.24	0.85	5.08	0.85		
Freq 1	0.1	0.3	0.2	0.1	0.1	0.8	0.1	0.2	0.1	0.3	0.1		
2													
3													
4													
5													
Σ	0.1	0.3	0.2	0.1	0.1	0.8	0.1	0.2	0.1	0.3	0.1		Σ = 2.40
RF=	4.17	12.50	8.33	4.17	4.17	33.33	4.17	8.33	4.17	12.50	4.17		
Cover (Basal) 1													
2													
3													
4													
5													
Σ	12.100	1.900	2.000	2.000	1.100	10.800							Σ = 29.900
RDom	40.47	6.35	6.69	6.69	3.68	36.12							
I.V.	0.455	0.358	.218	.134	.087	1.296	.050	.125	.050	.176	.050		

Rel. Density = $\frac{\text{No. individuals of } i^{th}}{\text{No. individuals of all species}} \times 100 = \frac{Ni}{} \times 100$

Rel. Freq. = $\frac{\text{Freq. of } i^{th} \text{ species}}{\Sigma \text{ Freq. of all species}} \times 100 = \frac{Fi}{} \times 100$

Rel. Dom. = $\frac{\Sigma \text{ of cover of } i^{th} \text{ species}}{\Sigma \text{ of cover of all species}} \times 100 = \frac{Ci}{} \times 100$



RNA VEGETATION

Directions for finding the permanent transect headstakes:

#1. 0.13 mile from SE RNA boundary sign.
17 paces on SW heading.

#2. 0.75 mile from SE RNA boundary sign.
39 paces due west from road, at crossroad.

#3. 1.00 mile from SE RNA boundary sign.
53 paces on 159 degree heading.

#4. Approximately 25 paces S from #3 headstake.

#5. 1.06 miles from SE RNA boundary sign. Small turn out on left side of road.
86 paces on 155 degree heading. Head down small drainage on 215 degree heading for approx. 100 paces. Headstake on N side of large boulder, beneath medium size white fir and larger ponderosa.

#6. Same starting place as #5.
91 paces on 310 degree heading.

#7. 1.40 miles from SE RNA boundary sign.
29 paces on 123 degree heading.

#8. 0.80 mile from SW RNA boundary sign, on road leading N, along W boundary.
Approximately 50 paces from RNA signpost on 120 degree heading.

#9. 64 paces W of E edge of ridge. Head along ridge.

#10. Off same road as #8.
46 paces from RNA signpost on 100 degree heading.

Type I. Dense
immature ponderosa pine

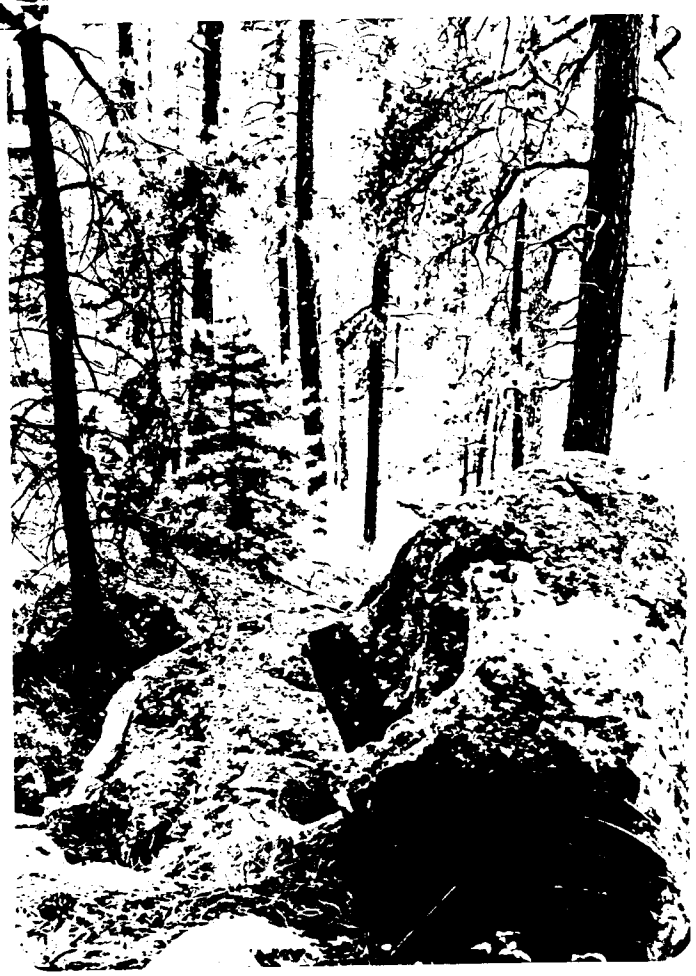
Transect 1

Type II. Open
mature ponderosa pine

Transect 2

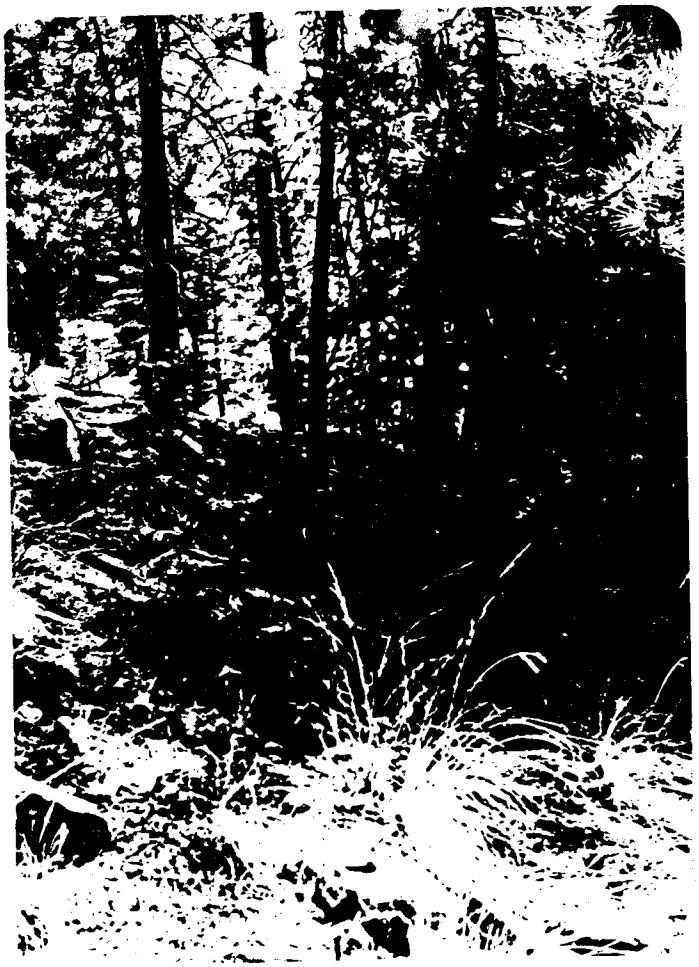
Type II. Open
mature ponderosa pine

Transect 3



Type II. Open
mature ponderosa pine

Transect 5



Type III. Ponderosa pine-mixed conifer

Transect 6

Type III. Ponderosa pine-mixed conifer

Transect 8

Type III. Ponderosa pine-mixed conifer

Transect 10

Type IV. Quercus

Transect 4

Type V. Cercocarpus

Transect 9a

Type V. Cercocarpus

Transect 9b